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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MARK E. MARLER and XIAODONG LUO

Appeal 2008-2888
Application 10/501,659
Technology Center 3600

Decided:[1] March 23, 2009

Before: JENNIFER D. BAHR, JOHN C. KERINS, and STEFAN STAICOVICI, *Administrative Patent Judges*.

BAHR, *Administrative Patent Judge*.

DECISION ON APPEAL

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[1] The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, begins to run from the decided date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

STATEMENT OF THE CASE

Mark E. Marler and Xiaodong Luo (Appellants) appeal under 35 U.S.C. § 134 from the Examiner's decision rejecting claims 1, 3-9, and 11-17, which are the only claims pending in the application. We have jurisdiction over this appeal under 35 U.S.C. § 6 (2002).

The Invention

Appellants' claimed invention is directed to elevator system design and, more particularly, an elevator system incorporating a belt assembly having a specialized groove configuration. Specification 1:8-10.

Claims 1, 15, and 17, reproduced below, are illustrative of Appellants' claimed subject matter.

> 1. A method of designing an elevator system having a belt with a plurality of grooves on one side of the belt that travels over at least a drive sheave, comprising the steps of:
>
> selecting a diameter of at least the drive sheave; and
>
> selecting a width of the grooves on the belt such that a ratio of the groove width to the sheave diameter is less than about .015.
>
> 15. An elevator belt assembly, comprising:
>
> a plurality of cords aligned generally parallel to a longitudinal axis of the elevator belt; and
>
> a jacket over the cords, the jacket including a plurality of grooves spaced longitudinally on at least one side of the jacket, the grooves including a fillet near the one side of the jacket, the plurality of cords, the jacket and the elevator belt each having

a first longitudinal end that is separate and distinct from a second, opposite longitudinal end.

17. An elevator belt assembly, comprising:

a plurality of cords aligned generally parallel to a longitudinal axis of the belt; and

a jacket over the cords, the jacket including a plurality of grooves spaced longitudinally on at least one side of the jacket, the grooves including a fillet near the one side of the jacket wherein each fillet has a radius of curvature that is between about 0.1mm and about 0.5mm.

The Rejections

The Examiner relies upon the following as evidence of unpatentability:

Hull	US 4,647,278	Mar. 3, 1987
Aulanko	US 6,199,666 B1	Mar. 13, 2001
Baranda	US 6,364,061 B2	Apr. 2, 2002
Yaginuma (as translated)[2]	JP 8-247221	Sep. 24, 1996

[2] All references to this document in our opinion are to the Ralph McElroy Translation Company translation dated January 21, 2003, made of record. The Thomson-Derwent machine-assisted translation of this document identifies the inventor as Takao Yaginuma, while the Ralph McElroy Translation Company translation of this reference identifies the inventor as Takao Yanaginuma. Inasmuch as both the Examiner and Appellants have referred to this document as "Yaginuma," we do likewise in this opinion for consistency.

Appellants seek review of the Examiner's rejections under 35 U.S.C. § 103(a) of:

- claims 1, 3-6[3, 4], 9, 11, and 12 as being unpatentable over Baranda and Yaginuma;
- claim 7 as being unpatentable over Baranda, Yaginuma, and Aulanko[5];
- claims 8, 13, and 14 as being unpatentable over Baranda, Yaginuma, and Hull;
- claims 15 and 16 as being unpatentable over Baranda and Hull; and
- claim 17 as being unpatentable over Hull.

SUMMARY OF DECISION

We AFFIRM.

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[3] The Examiner had inadvertently omitted claim 3 from the statement of this rejection on page 2 of the Final Rejection, but had clearly discussed claim 3 in the detailed explanation of the rejection on page 3 of the Final Rejection. The Examiner had included claim 7 in this rejection in the Final Rejection, but omitted claim 7 from the statement of the rejection and from the discussion of the rejection in the Answer. Accordingly, we treat the rejection of claim 7 as being unpatentable over Baranda and Yaginuma as having been withdrawn by the Examiner.

[4] Appellants have contested the rejection of claim 3 on page 5 of the Reply Brief.

[5] Appellants have contested this rejection on page 6 of the Reply Brief. Appellants' assertion that this rejection was made for the first time in the Answer is not accurate. This rejection was set forth on pages 7 and 8 of the Final Rejection.

ISSUES

Appellants have not presented arguments for the patentability of claims 3[6], 4, 9, 11, and 12 apart from claim 1. Therefore, in accordance with 37 C.F.R. § 41.37(c)(1)(vii) (2008), we select claim 1 as the representative claim to decide the appeal of the rejection of these claims, with claims 3, 4, 9, 11, and 12 standing or falling with claim 1. Appellants have argued claims 5 and 6 together. Thus, claim 6 stands or falls with representative claim 5, from which it depends. Appellants have argued claims 8, 13, and 14 together as a group. We select claim 8 as the representative claim, and claims 13 and 14 stand or fall with claim 8. Appellants have argued claims 15 and 16 together as a group. Thus, claim 16 stands or falls with representative claim 15, from which it depends. Appellants have separately argued the rejection of claim 17.

The first issue for our consideration is whether Appellants have demonstrated error in the Examiner's determination that the combination of Baranda and Yaginuma proposed by the Examiner would have prompted a person of ordinary skill in the art to design an elevator system wherein the ratio of the width of the grooves on the belt to the sheave diameter is less than about .015, as called for in claim 1. This issue turns on whether Baranda teaches or suggests using a belt only with a sheave having a diameter of 80 mm or 77 mm, as Appellants assert (Appeal Br. 8-11), or with a range of sheave diameters from 380 mm down to the theoretical 80%

[6] Appellants' bald assertion that "there is nothing even in the proposed combination that comes close to the limitations of claim 3" (Reply Br. 5) does not rise to the level of a separate argument for patentability.

reduced sheave diameter of 64 mm, as asserted by the Examiner (Answer 4, 15).

A second issue for our consideration is whether Appellants have demonstrated the Examiner erred in determining that the proposed combination of Baranda and Yaginuma would have led a person of ordinary skill in the art to select a groove width to sheave diameter ratio based upon an expected speed of elevator cab travel, as called for in claim 5.

A third issue is whether Appellants have demonstrated the Examiner failed to articulate reasoning with rational underpinning to support the conclusion that it would have been obvious to provide fillets at the edges of each groove on the belt of Baranda, as required in claims 8 and 15.

A fourth issue is whether Appellants have demonstrated the recitation of a fillet radius of curvature between about 0.1 mm and about 0.5 mm patentably distinguishes claim 17 over the belt of Hull.

FACTS PERTINENT TO THE ISSUES

1. Appellants' Specification defines the meaning of "about" when used before a parameter as "[including] amounts varying by almost a full unit more or less within a factor of ten. For example, 'about .008' should be interpreted to at least include a range from .0071 to .0089 and 'about .05' should be interpreted to at least include a range from .041 to .059." Specification 9:5-8.
2. Appellants' Specification discloses that in accordance with Appellants' invention, "[t]he ratio of the groove width to the sheave diameter is chosen to be less than about .05." Specification 3:6-7. Using

Appellants' definition of "about," this translates to a chosen groove width to sheave diameter ratio of less than .059.

3. Appellants' Specification discloses that "[a] radius of curvature of the fillets may be customized along with other system parameters to minimize vibrations and noise. *In one example*, the fillets have a radius of curvature between about .1 mm and about .5 mm." Specification 3:19-21 (emphasis ours).

4. Appellants' Specification further discloses that:

> In general, it is more preferable to have a *larger* radius of curvature, which tends to smooth out the transition between the side 32 of the jacket 24 and the grooves 30. A belt incorporating the inventive fillet design will include a fillet radius of curvature in the range from about 0.1 mm to about 0.5 mm."

Specification 6:2-5 (emphasis ours).

5. Appellants' Specification does not give any indication that an upper limit to the range of about 0.5 mm is critical or produces any unexpected result. Nor has Appellant presented any evidence as to the criticality of such upper limit.

6. Baranda teaches that when using steel ropes as tension members in a conventional traction elevator system, safety codes require that the ropes have a minimum diameter of 8 mm (9.5 mm for ANSI) and that the ratio of the sheave diameter to the rope diameter be greater than or equal to 40, thus resulting in sheave diameters of *at least* 320 mm (380 mm for ANSI). Baranda, col. 1, ll. 36-43.

7. Larger sheave diameters require greater torque from the machine to drive the elevator system. Baranda, col. 1, ll. 43-45. Thus, minimizing the sheave diameter permits the use of less costly, more compact, high

speed motors as the drive machines without the need for a gearbox to increase torque. Baranda, col. 2, ll. 50-52. It is thus desirable to reduce the sheave diameter.

8. A person of ordinary skill in the art would consider the desired speed of cab travel, as well as torque requirements, in selecting a motor as a drive machine for an elevator system.

9. Baranda teaches using a tension member 22 including a plurality of individual ropes 26 encased with a common layer of coating 28 to distribute the rope pressure more uniformly throughout the tension member. Baranda, col. 2, ll. 36-43; col. 4, ll. 17-19. Such a tension member configuration reduces the effective rope diameter, thus permitting smaller sheave diameters without a reduction in the sheave diameter to rope diameter ratio. Baranda, col. 2, ll. 46-50.

10. Baranda cites one example, wherein the use of three tension members, each with five 3 mm aramid fiber ropes *may* result in reductions in *approximately* eighty percent in sheave diameter as compared to conventional steel ropes (four 10 mm SISAL steel wire ropes) and reductions of *approximately* sixty percent in sheave diameter as compared to conventional round ropes formed from comparable aramid fibers (three 8 mm aramid fiber ropes). Baranda, col. 7, ll. 33-43.

11. Accepting Appellants' assumptions and calculations on page 9 of the Appeal Brief, which the Examiner has not disputed, Baranda teaches or suggests that, *for the particular example cited*, sheave diameters could potentially be reduced to as low as *approximately* 80 or 76.8 mm, depending on other design considerations.

12. Baranda gives no indication that the particular tension member arrangement cited, with three tension members, each with five 3 mm aramid fiber ropes, is the only suitable tension member configuration.
13. Baranda gives no indication that reducing the sheave diameter to exactly 80 mm or 76.8 mm is essential to the invention disclosed therein.
14. We find that Baranda includes in its teachings not only sheave diameters on the order of 80 mm (or 76.8 mm), but also sheave diameters which are substantially reduced relative to the conventional 320 mm or 380 mm diameters but greater than 80 mm.
15. Yaginuma teaches that it was known in the art to provide longitudinally spaced grooves, having a groove width of 1.5 mm, in power transmission belts comprising tensile core wires made of steel wires, aramid fibers, or glass fibers embedded in a belt body, as a reference for arranging the tensile core wires during molding. Yaginuma, paras. [0002], [006], and [0009].
16. Yaginuma further teaches providing the grooves at oblique angles, within the range of 10-90 degrees, preferably within the range of about 40-70 degrees, to minimize the impact noise generated when the grooves make contact with the pulley during movement. Yaginuma, paras. [0002], [0007], and [0008].
17. A person of ordinary skill in the art would have been prompted by the teachings of Yaginuma to provide longitudinally spaced grooves configured as taught by Yaginuma on Baranda's tension member as a reference for arranging the tension ropes or wires during molding.
18. Appellants have not specifically disputed the Examiner's determination that it would have been obvious to provide longitudinally spaced

grooves having a width of 1.5 mm as taught by Yaginuma on Baranda's belt (Answer 4).

19. For a sheave diameter of 80 mm and a belt groove width of 1.5 mm, the groove width to sheave diameter ratio is .0188. For a sheave diameter of 76.8 mm and a belt groove width of 1.5 mm, the groove width to sheave diameter ratio is .0195.
20. Hull teaches providing power transmission belts with molded spaced apart transversely disposed grooves 28 having fillets (opposed ends 46) defined by a radius of curvature of approximately 0.031 in. (.78 mm) and cut longitudinally extending grooves 26 having fillets (opposed ends 35') with a radius of curvature of approximately 0.01 ± 0.002 in. (.254 ± .0508 mm) in order to improve the belt life of the resulting belt. Hull, col. 1, ll. 27 and 33-39; col. 4, ll. 4-12 and 22-27.
21. Hull would have prompted a person of ordinary skill in the art to provide longitudinal and transverse grooves as taught by Hull on the tension member of Baranda in order to improve the belt life of the resulting belt.
22. Hull's belt includes a load carrying section 23 comprising a plurality of cords aligned generally parallel to a longitudinal axis of the belt. Hull, col. 2, l. 43; Figures 1 and 2.

PRINCIPLES OF LAW

While there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness, "the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and

creative steps that a person of ordinary skill in the art would employ." *KSR Int'l. Co. v. Teleflex Inc.*, 550 U.S. ___, 127 S. Ct. 1727, 1741 (2007). Moreover, while the demonstration of a teaching, suggestion, or motivation (the TSM test established by the Court of Customs and Patent Appeals) to combine known elements in order to show that the combination is obvious may be "a helpful insight," it cannot be used as a rigid and mandatory formula. *Id.*

"A person of ordinary skill is also a person of ordinary creativity, not an automaton." *Id.* at ___, 127 S. Ct. at 1742.

A reference is not limited to its preferred embodiment, but must be evaluated for all of its teachings, including its teachings of non-preferred embodiments. *In re Burckel*, 592 F.2d 1175, 1179 (CCPA 1979).

> The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. These cases have consistently held that in such a situation, the applicant must show that the particular range is *critical*, generally by showing that the claimed range achieves unexpected results relative to the prior art range.

In re Woodruff, 919 F.2d 1575, 1578 (Fed. Cir. 1990) (citations omitted).

ANALYSIS

Claim construction

Consistent with the definition of "about" in Appellants' definition, as set forth in our findings above, we construe the range of "less than about .015" in claim 1 as including any ratio less than .0159, and the range of "between about 0.1 mm and about 0.5 mm" in claim 17 as a range between 0.01 mm and 0.59 mm.

Claim 1

As noted in our findings above, Appellants have not specifically disputed the Examiner's determination that it would have been obvious to provide longitudinally spaced grooves having a width of 1.5 mm as taught by Yaginuma on Baranda's belt. In any event, we find that a person of ordinary skill in the art would have been prompted by the teachings of Yaginuma to provide longitudinally spaced grooves configured as taught by Yaginuma on Baranda's tension member as a reference for arranging the tension ropes or wires during molding.

With regard to the question of the scope of Baranda's teachings with respect to sheave diameter, we find that the Examiner has the better position. Even accepting Appellants' assumptions and calculations on page 9 of the Appeal Brief, which the Examiner has not disputed, Baranda teaches or suggests that, *for the particular example cited*, sheave diameters could potentially be reduced to as low as *approximately* 80 or 76.8 mm, depending on other design considerations. Baranda gives no indication that the particular tension member arrangement cited, with three tension members, each with five 3 mm aramid fiber ropes, is the only suitable tension member configuration, or that reducing the sheave diameter to exactly 80 mm or 76.8 mm is essential to the invention disclosed therein. Accordingly, we find that Baranda includes in its teachings not only sheave diameters on the order of 80 mm (or 76.8 mm), but also sheave diameters, such as 95 mm, for example, which are substantially reduced relative to the conventional 320 mm or 380 mm diameters but greater than 80 mm. A sheave diameter of 95 mm with a belt groove width of 1.5 mm results in a groove width to sheave diameter ratio of .0158, which is within the claimed range. Moreover,

Appellants have not shown that a groove width to sheave diameter ratio in the claimed range of less than .0159 achieves any unexpected or unpredictable result as compared with a ratio of .0188 (the ratio for a belt groove width of 1.5 mm and a sheave diameter of 80 mm). In fact, Appellants' Specification indicates that a ratio up to .059 mm would be suitable.

For the above reasons, Appellants have not demonstrated that the belt groove width diameter to sheave diameter ratio called for in claim 1 distinguishes the claimed subject matter over the prior art.

Claim 5

As noted in our findings above, Baranda teaches that minimizing the sheave diameter permits the use of less costly, more compact, high speed motors as the drive machines without the need for a gearbox to increase torque. Further, a person of ordinary skill in the art would consider the desired speed of cab travel, as well as torque requirements, in selecting a motor as a drive machine for an elevator system. Moreover, Appellants have not specifically disputed the Examiner's determination that it would have been obvious to provide longitudinally spaced grooves having a width of 1.5 mm as taught by Yaginuma on Baranda's belt. Thus, a person of ordinary skill in the art designing an elevator system intended to move the cab at a high rate of speed would seek to minimize the sheave diameter, hence indirectly increasing the ratio of groove width to sheave diameter for a belt having a groove width of 1.5 mm as taught by Yaginuma, to permit use of a high speed motor without the need for a gearbox to increase torque. Baranda thus would have reasonably suggested selecting the ratio of groove

width to sheave diameter based upon an expected speed of elevator cab travel.

Claim 7

In contesting the rejection of claim 7 as being unpatentable over Baranda, Yaginuma, and Aulanko, Appellants appear to have relied on their argument, discussed above, that the combined teachings of Baranda and Yaginuma would not have prompted a person of ordinary skill in the art to combine the teachings of Baranda and Yaginuma so as to provide a sheave diameter of greater than 80 mm with a belt as the tension member. For the reasons discussed above, we do not find this argument persuasive. Appellants' bald assertion that "there is no reason to incorporate the teachings of [Aulanko] into the improper combination" (Reply Br. 6) does not amount to an additional argument for the patentability of claim 7.

Claims 8 and 15

The combination of Baranda and Yaginuma does not explicitly teach providing the grooves with fillets, as called for in claims 8 and 15. According to the Examiner, it would have been obvious to provide fillets as taught by Hull to the belt disclosed by Baranda to improve belt life and reduce the noise during operation. Answer 11. Hull teaches providing power transmission belts with molded spaced apart transversely disposed grooves 28 having fillets and cut longitudinally extending grooves 26 having fillets in order to improve the belt life of the resulting belt. Accordingly, Hull would have prompted a person of ordinary skill in the art to provide longitudinal and transverse grooves as taught by Hull on the tension member of Baranda in order to improve the belt life of the resulting belt. Thus, we find that the Examiner articulated reasoning with rational underpinning to

support the conclusion that the provision of grooves having fillets as taught by Hull on the tension member of Baranda would have been obvious. While the combination of Baranda, Yaginuma, and Hull may not explicitly support the Examiner's additional stated reason, namely, to reduce noise, to provide grooves with fillets on Baranda's tension member, this does not detract from the Examiner's articulation of a reason with rational underpinning to make the modification.

Claim 17

Hull's belt includes a load carrying section 23 comprising a plurality of cords aligned generally parallel to a longitudinal axis of the belt. Hull's belt is provided with molded spaced apart transversely disposed grooves 28 having fillets (opposed ends 46) defined by a radius of curvature of approximately 0.031 in. (.78 mm). This radius of curvature does not fall within the range between 0.01 mm and 0.59 mm called for in claim 17. However, Appellants' Specification does not give any indication that the upper limit to the range of about 0.5 mm (i.e., 0.59 mm) is critical or produces any unexpected result; nor have Appellants presented any evidence as to the criticality of such upper limit. Indeed, Appellants' Specification indicates that the radius of curvature of the fillets may be customized along with other system parameters to minimize vibrations and noise, and that, in general, a larger radius of curvature is more preferred. Therefore, Appellants have failed to demonstrate a patentable distinction between claim 17 and the belt of Hull.

CONCLUSIONS OF LAW

Appellants have not demonstrated error in the Examiner's determination that the combination of Baranda and Yaginuma proposed by

the Examiner would have prompted a person of ordinary skill in the art to design an elevator system wherein the ratio of the width of the grooves on the belt to the sheave diameter is less than about .015, as called for in claim 1. Therefore, Appellants have not persuaded us the Examiner erred in rejecting claim 1, or claims 3, 4, 9, 11, and 12, which stand or fall with claim 1, as being unpatentable over Baranda and Yaginuma.

Appellants have not demonstrated the Examiner erred in determining that the proposed combination of Baranda and Yaginuma would have led a person of ordinary skill in the art to select a groove width to sheave diameter ratio based upon an expected speed of elevator cab travel, as called for in claim 5. Therefore, Appellants have not persuaded us the Examiner erred in rejecting claim 5, or claim 6, which stands or falls with claim 5, as being unpatentable over Baranda and Yaginuma.

In light of the above, Appellants likewise have not demonstrated error in the rejection of claim 7 as being unpatentable over Baranda, Yaginuma, and Aulanko.

Appellants have not demonstrated the Examiner failed to articulate reasoning with rational underpinning to support the conclusion that it would have been obvious to provide fillets at the edges of each groove on the belt of Baranda, as required in claims 8 and 15. Therefore, Appellants have not persuaded us that the Examiner erred in rejecting claim 8, or claims 13 and 14, which stand or fall with claim 8, as being unpatentable over Baranda, Yaginuma, and Hull. Appellants likewise have not persuaded us the Examiner erred in rejecting claim 15, or claim 16, which stands or falls with claim 15, as being unpatentable over Baranda and Hull.

Appellants have not demonstrated the recitation of a fillet radius of curvature between about 0.1 mm and about 0.5 mm patentably distinguishes claim 17 over the belt of Hull. Appellants thus have not persuaded us the Examiner erred in rejecting claim 17 as being unpatentable over Hull.

DECISION

The Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv) (2007).

AFFIRMED

JRG

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